

What is claimed is:

1. A method of upregulating telomerase expression in a eukaryotic cell, tissue, or organ, comprising contacting the eukaryotic cell, tissue, or organ with a peptide compound having the formula:

R<sub>1</sub> Gln Tyr Lys Leu Gly Ser Lys Thr Gly Pro Gly Gln R<sub>2</sub> (SEQ ID NO:1),  
wherein R<sub>1</sub> is absent or is an amino terminal capping group and R<sub>2</sub> is absent or is a carboxy terminal capping group of the peptide compound; and wherein the peptide compound is present in an amount effective to upregulate expression of telomerase in the eukaryotic cell, tissue, or organ.

2. A method of upregulating telomerase expression in a eukaryotic cell, tissue, or organ, comprising contacting the eukaryotic cell, tissue, or organ with a peptide compound having the formula:

R<sub>1</sub> Gln Thr Leu Gln Phe Arg R<sub>2</sub> (SEQ ID NO:2),  
wherein R<sub>1</sub> is absent or is an amino terminal capping group and R<sub>2</sub> is absent or is a carboxy terminal capping group of the peptide compound; and wherein the peptide compound is present in an amount effective to upregulate expression of telomerase in the eukaryotic cell, tissue, or organ.

3. A method of upregulating telomerase expression in a eukaryotic cell, tissue, or organ, comprising contacting the eukaryotic cell, tissue, or organ with a peptide compound having the formula:

R<sub>1</sub> Xaa<sub>1</sub> Gly Xaa<sub>3</sub> Xaa<sub>4</sub> Xaa<sub>5</sub> Xaa<sub>6</sub> Xaa<sub>7</sub> R<sub>2</sub> (SEQ ID NO:3),  
wherein Xaa<sub>1</sub> and Xaa<sub>3</sub> are, independently, aspartic acid or asparagine; R<sub>1</sub> is absent or is an amino terminal capping group of the peptide compound; Xaa<sub>4</sub> is absent or Gly; Xaa<sub>5</sub> is absent, Asp, or Phe; Xaa<sub>6</sub> is absent, Ala, or Phe; Xaa<sub>7</sub> is absent or Ala; R<sub>2</sub> is absent or is a carboxy terminal capping group of the peptide compound; and wherein the peptide compound is present in an amount effective to upregulate expression of telomerase in the eukaryotic cell, tissue, or organ.

4. The method according to Claim 3, wherein the peptide compound is selected from the group consisting of:

Asp Gly Asp,

Asp Gly Asn,  
Asn Gly Asn,  
Asn Gly Asp,  
Asp Gly Asp Gly Asp (SEQ ID NO:4),  
Asp Gly Asp Gly Phe Ala (SEQ ID NO:5),  
Asp Gly Asp Gly Asp Phe Ala (SEQ ID NO:6),  
Asp Gly Asn Gly Asp Phe Ala (SEQ ID NO:7),  
Asn Gly Asn Gly Asp Phe Ala (SEQ ID NO:8), and  
Asn Gly Asp Gly Asp Phe Ala (SEQ ID NO:9),

wherein the peptide compound is present in an amount effective to upregulate expression of telomerase in the eukaryotic cell, tissue, or organ.

5. A method of upregulating telomerase expression in a eukaryotic cell, tissue, or organ, comprising contacting the eukaryotic cell, tissue, or organ with a peptide compound having the formula:

$R_1$  Asn Ser Thr  $R_2$ ,

wherein  $R_1$  is absent or is an amino terminal capping group;  $R_2$  is absent or is a carboxy terminal capping group of the peptide compound; and wherein the peptide compound is present in an amount effective to upregulate expression of telomerase in the eukaryotic cell, tissue, or organ.

6. A method of upregulating telomerase expression in a eukaryotic cell, tissue, or organ, comprising contacting the eukaryotic cell, tissue, or organ with a peptide compound having the formula:

$R_1$  Phe Asp Gln  $R_2$ ,

wherein  $R_1$  is absent or is an amino terminal capping group;  $R_2$  is absent or is a carboxy terminal capping group of the peptide compound; and wherein the peptide compound is present in an amount effective to upregulate expression of telomerase in the eukaryotic cell, tissue, or organ.

7. A method of upregulating telomerase expression in a eukaryotic cell, tissue, or organ, comprising contacting the eukaryotic cell, tissue, or organ with a peptide compound having the formula:

$R_1$  Xaa<sub>1</sub> Xaa<sub>2</sub> Met Thr Leu Thr Gln Pro  $R_2$  (SEQ ID NO:10),

wherein Xaa<sub>1</sub> is absent or Ser; Xaa<sub>2</sub> is absent or Lys; R<sub>1</sub> is absent or is an amino terminal capping group; R<sub>2</sub> is absent or is a carboxy terminal capping group of the peptide compound; and wherein the peptide compound is present in an amount effective to upregulate expression of telomerase in the eukaryotic cell, tissue, or organ.

8. The method according to Claim 7, wherein the peptide compound is selected from the group consisting of:

Met Thr Leu Thr Gln Pro (SEQ ID NO:11) and

Ser Lys Met Thr Leu Thr Gln Pro (SEQ ID NO:12),

wherein the peptide compound is present in an amount effective to upregulate expression of telomerase in the eukaryotic cell, tissue, or organ.

9. A method of upregulating telomerase expression in a eukaryotic cell, tissue, or organ, comprising contacting the eukaryotic cell, tissue, or organ with a peptide compound having the formula:

R<sub>1</sub> Asp Gly Xaa<sub>3</sub> Xaa<sub>4</sub> Xaa<sub>5</sub> R<sub>2</sub> (SEQ ID NO:13),

wherein R<sub>1</sub> is absent or is an amino terminal capping group; Xaa<sub>3</sub> is Glu or Leu; Xaa<sub>4</sub> is Ala or Glu; Xaa<sub>5</sub> is absent, Leu, or Ala; and R<sub>2</sub> is absent or is a carboxy terminal capping group of the peptide compound; and wherein the peptide compound is present in an amount effective to upregulate expression of telomerase in the eukaryotic cell, tissue, or organ.

10. The method according to Claim 9, wherein said peptide compound is selected from the group consisting of:

R<sub>1</sub> Asp Gly Glu Ala R<sub>2</sub> (SEQ ID NO:14),

R<sub>1</sub> Asp Gly Glu Ala Leu R<sub>2</sub> (SEQ ID NO:16), and

R<sub>1</sub> Asp Gly Leu Glu Ala R<sub>2</sub> (SEQ ID NO:17),

wherein R<sub>1</sub> is absent or is an amino terminal capping group of the peptide compound and R<sub>2</sub> is absent or is a carboxy terminal capping group of the peptide compound; and wherein the peptide compound is present in an amount effective to upregulate expression of telomerase in the eukaryotic cell, tissue, or organ.

11. The method according to Claim 10, wherein said peptide compound is:

[Ac] Asp Gly Glu Ala (SEQ ID NO:14),

wherein [Ac] is an acetyl amino terminal capping group; and wherein the peptide compound is present in an amount effective to upregulate expression of telomerase in the eukaryotic cell, tissue, or organ.

12. A method of upregulating telomerase expression in a eukaryotic cell, tissue, or organ, comprising contacting the eukaryotic cell, tissue, or organ with a peptide compound having the formula:

R<sub>1</sub> Xaa<sub>1</sub> Xaa<sub>2</sub> Asp Gly Xaa<sub>5</sub> Xaa<sub>6</sub> Xaa<sub>7</sub> Xaa<sub>8</sub> Xaa<sub>9</sub> Xaa<sub>10</sub> Xaa<sub>11</sub> R<sub>2</sub> (SEQ ID NO:15),

wherein R<sub>1</sub> is absent or is an amino terminal capping group; Xaa<sub>1</sub> is absent or any amino acid; Xaa<sub>2</sub> is absent or any amino acid; Xaa<sub>5</sub> is Glu or Leu; Xaa<sub>6</sub> is Ala or Glu; Xaa<sub>7</sub> is absent, Leu, or Ala; Xaa<sub>8</sub> is absent or is any amino acid; Xaa<sub>9</sub> is absent or is any amino acid; Xaa<sub>10</sub> is absent or is any amino acid; Xaa<sub>11</sub> is absent or is any amino acid; and R<sub>2</sub> is absent or is a carboxy terminal capping group of the peptide compound; and wherein the peptide compound is present in an amount effective to upregulate expression of telomerase in the eukaryotic cell, tissue, or organ.

13. A method of upregulating telomerase expression in a eukaryotic cell, tissue, or organ, comprising contacting the eukaryotic cell, tissue, or organ with a peptide compound having the formula:

R<sub>1</sub> Xaa<sub>1</sub> Xaa<sub>2</sub> Xaa<sub>3</sub> R<sub>2</sub>,

wherein Xaa<sub>1</sub> is Asp, Asn, Glu, Gln, Thr, or Tyr; Xaa<sub>2</sub> is absent or any amino acid; Xaa<sub>3</sub> is absent or is Glu, Thr, Ser, Gly, or Leu; R<sub>1</sub> is absent or is an amino terminal capping group and R<sub>2</sub> is absent or is a carboxy terminal capping group of the peptide compound; and wherein the peptide compound is present in an amount effective to upregulate expression of telomerase in the eukaryotic cell, tissue, or organ.

14. The method according to Claim 13, wherein Xaa<sub>2</sub> is selected from the group consisting of Val, Gly, Glu, and Gln.

15. The method according to Claim 13, wherein the peptide compound is selected from the group consisting of:

R<sub>1</sub> Asp Gly R<sub>2</sub>, R<sub>1</sub> Asn Gly R<sub>2</sub>, R<sub>1</sub> Glu Gly R<sub>2</sub>, R<sub>1</sub> Gln Gly R<sub>2</sub>, and R<sub>1</sub> Thr Val Ser R<sub>2</sub>, wherein R<sub>1</sub> is absent or is an amino terminal capping group and R<sub>2</sub> is absent or is a carboxy terminal capping group of the peptide compound.

16. The method according to Claim 15, wherein the peptide compound has the formula:



wherein R<sub>1</sub> is a thyronine group.

17. The method according to Claim 16, wherein the thyronine group is selected from the group consisting of a thyronine group having no iodine substitutions, a monoiodothyronine, a diiodothyronine, a triiodothyronine, and a tetraiodothyronine.

18. The method according to Claim 17, wherein the thyronine group is triiodothyronine.

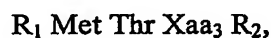
19. The method according to Claim 18, wherein the triiodothyronine is 3,5,3'-triiodothyronine.

20. A method of upregulating telomerase expression in a eukaryotic cell, tissue, or organ, comprising contacting the eukaryotic cell, tissue, or organ with a peptide compound having the formula:



wherein Xaa<sub>2</sub> is any amino acid; Xaa<sub>3</sub> is Gln or Tyr; R<sub>1</sub> is absent or is an amino terminal capping group; R<sub>2</sub> is absent or is a carboxy terminal capping group of the peptide compound; and wherein the peptide compound is present in an amount effective to upregulate expression of telomerase in the eukaryotic cells, tissue, or organ.

21. A method of upregulating telomerase expression in a eukaryotic cell, tissue, or organ, comprising contacting the eukaryotic cell, tissue, or organ with a peptide compound having the formula:



wherein Xaa<sub>3</sub> is Asn, Asp, Glu, Thr, or Leu; R<sub>1</sub> is absent or is an amino terminal capping group; R<sub>2</sub> is absent or is a carboxy terminal capping group of the peptide compound; and wherein the peptide compound is present in an amount effective to upregulate expression of telomerase in the eukaryotic cell, tissue, or organ.

22. The method according to any one of Claims 1, 2, 3, 5, 6, 7, 9, 10, 12, 13, 20, and 21, wherein the R<sub>1</sub> amino terminal capping group is selected from the group consisting of a lipoic acid moiety (Lip); a glucose-3-O-glycolic acid moiety (Gga); 1 to 6 lysine residues; 1 to 6 arginine residues; a combination of 2 to 6 lysine and arginine residues; a thyronine group; an acyl group of the formula R<sub>3</sub>-CO-, where CO is a carbonyl group and R<sub>3</sub> is a hydrocarbon chain having from 1 to 25 carbon atoms; and combinations thereof.

23. The method according to Claim 22, wherein the amino terminal capping group is an acyl group of the formula R<sub>3</sub>-CO-, where CO is a carbonyl group and R<sub>3</sub> is a hydrocarbon chain having from 1 to 22 hydrocarbons and wherein the hydrocarbon chain is a saturated, unsaturated, branched, or unbranched hydrocarbon chain.

24. The method according to Claim 22, wherein the amino terminal capping group is an acyl group.

25. The method according to Claim 24, wherein the acyl group is a fatty acyl group.

26. The method according to Claim 24 wherein the acyl group is selected from the group consisting of: acetyl, palmitoyl (Palm), and docosahexaenol (DHA).

27. The method according to Claim 22, wherein the thyronine group is selected from the group consisting of a thyronine having no iodine substitutions, a monoiodothyronine, a diiodothyronine, a triiodothyronine, and a tetraiodothyronine.

28. The method according to Claim 27, wherein the thyronine group is triiodothyronine.

29. The method according to Claim 28, wherein the triiodothyronine is a 3,5,3'-triiodothyronine.
30. The method according to any one of Claims 1, 2, 3, 5, 6, 7, 9, 10, 12, 13, 20, and 21, wherein the R<sub>2</sub> carboxy terminal capping group is a primary or secondary amine.
31. The method according to any one of Claims 1, 2, 3, 5, 6, 7, 9, 10, 12, 13, 20, and 21, wherein the peptide compound is provided in a composition for administration to a eukaryotic organism through a route selected from the group consisting of an oral route, an intravenous route, an intra-arterial route, an intramuscular route, and a subcutaneous route.